CLAIMS

What is claimed is:

1. An apparatus for controlling a wireless purchase of merchandise from a vending machine, the apparatus comprising:

a controller device for controlling vending operations of the vending machine; and

a wireless modem device for communicating between a network and the controller device, the wireless modem device being adapted to receive via the network a short message originated from a purchaser and to communicate the short message to the controller device;

whereby, upon the receipt of the short message, the controller device initiates a vending operation, controls the vending operation, and communicating transaction information of the vending operation to a central computer.

2. The apparatus of claim 1 wherein the controller device comprises a central processing unit and a memory member communicated with each other, the memory member having a read only memory which contains a system control program for controlling the wireless purchase from the vending machine.

3. The apparatus of claim 2 wherein the controller device further comprises:

a transceiver for communicating the central processing unit with the wireless modem; and

a programmable peripheral interface circuit communicated with the central processing unit.

4. The apparatus of claim 1 further comprising a coin simulation circuit for simulating a purchase signal and sending the same to the vending machine.

5. The apparatus of claim 4 wherein the controller device further comprises a programmable peripheral interface circuit communicated between the central processing unit and the coin simulation circuit.

6. The apparatus of claim 1 wherein the controller device converts the transaction information to a short message before sending the same to a central computer.

7. The apparatus of claim 1 further comprising a power circuit for supplying power to the controller device, the power circuit including a back up power supply.

8. The apparatus of claim 1 further comprising a merchandise dispensing circuit for receiving a dispensing signal from the vending machine and forwarding the same to the controller device.

9. The apparatus of claim 1 further comprising a coin detection circuit for detecting a purchase signal from the vending machine and communicating the purchase signal to the controller device.

10. The apparatus of claim 1 further comprising a sold out circuit for receiving a sold out signal from the vending machine and communicating the sold out signal to the controller device.

11. The apparatus of claim 1 further comprising a display panel circuit for communicating a wireless purchase message from the controller device to the vending machine for displaying.

12. The apparatus of claim 1 wherein the controller device is adapted to communicate transaction information to the wireless modem, and the wireless modem device is adapted to communicate the transaction information to a central computer via the network.

13. The apparatus of claim 11 wherein the controller device is adapted to convert the transaction information in to a second short message and communicate the second short message to a central computer.

14. The system of claim 1 further comprising a quantity counter circuit adapted to obtain merchandise quantity data from the vending machine and for communicating the quantity data to the controller device.

15. A system for controlling a wireless purchase from a vending machine, the system comprising:

a vending machine for storing and dispensing merchandise;

a controller device for controlling vending operations of the vending machine, the controlling device being adapted to initiate a vending operation and transmit transaction information of the vending operation to a central computer;

a wireless modem for communicating between a network and the controller device, the wireless modem device being adapted to receive via the network a short message originated from a purchaser and to communicate the short message to the controller device, the wireless modem also being adapted to receive the transaction information from the controller device and communicate the transaction information to a central computer; and

a central computer for communicating with the wireless modem via the network, the central computer being adapted to receive and store the transaction information transmitted by the controller device,

whereby, upon receipt of the short message originated from the purchaser, the controller device simulates and sends a purchase signal to the vending machine to thereby initiate the vending operation and sends vending transaction information to the central computer.

16. The system of claim 15 wherein the controller device is capable of converting the transaction information into a short message.

17. The system of claim 16 wherein the vending machine comprises a display controller for receiving a purchase signal to initiate the vending operation.

18. The system of claim 17 further comprising a coin simulation circuit for simulating a purchase signal and send the same to the display controller.

19. The system of claim 18 wherein the vending machine further comprises a coin mech device for receiving a cash payment, the coin mech being adapted to send a purchase signal to the display controller upon receiving a cash payment.

20. The system of claim 15 wherein the vending machine further comprises a display panel and a selection button where a purchase selection can be made for the wireless purchase.

21. A system for controlling wireless purchase from and for managing inventory in a vending machine, the system comprising:

a vending machine for storing and dispensing merchandise;

a quantity counter circuit being adapted to obtain merchandise quantity data from the vending machine and for communicating the quantity data to a controller device;

a controller device for acquiring inventory and transaction data and controlling vending operations of the vending machine, the controlling device being adapted to initiate a vending operation upon receipt of a first short message service originated from a purchaser, to collect transaction information about the vending operation, to transmit the transaction information and the merchandise quantity data to a central computer;

a wireless modem for communicating between a network and the controller device, the wireless modem being adapted to receive via a network a short message service originated from a purchaser and transmit the short message service to the controller device, the wireless modem being also adapted to communicate the transaction information and the merchandise quantity data from the controller device to a central computer; and

a central computer for communicating with the wireless modem via the network, the central computer being adapted to store the transaction information and the merchandise quantity data as setting information for the vending machine when the vending machine comes on-line.

22. The system of claim 21 wherein the transaction information is a short message.

23. The system of claim 21 wherein the controller device is adapted to simulate and send a purchase signal to the vending machine to initiate the wireless purchase.

24. The system of claim 23 wherein the vending machine comprises a display controller, the controller device being adapted to send the purchase signal to the display controller.

25. The system of claim 24 wherein the vending machine further comprises a display panel and a selection button where a purchase selection is made.

26. The system of claim 21 wherein the vending machine further comprises a display controller and a coin mech device for receiving a payment of cash, the coin mech being adapted to send a payment signal to the display controller upon receiving a cash payment.

27. The system of claim 26 wherein the vending machine further comprises a display panel and a selection button where a purchase selection is made.

28. A method for controlling a wireless purchase from a vending machine, the method comprising:

receiving a short message;

simulating a coin mech signal and transmitting the same to a vending machine to initiate a vending operation.

29. The method of claim 28 wherein the coin mech signal is similar to that generated by the vending machine when it is coin operated.

30. The method of claim 28 further comprising:

collecting transaction information of the vending operation; and

transmitting the transaction information to a central computer.

31. The method of claim 30 wherein the transaction information of the vending operation is a short message.

32. A method for conducting a wireless purchase from a vending machine, the method comprising:

receiving a purchase request;

converting the purchase request to a short message; and

transmitting the short message to a vending machine to initiate a vending operation.

33. A method for conducting a wireless purchase from a vending machine, the method comprising:

sending a purchase request through a cellular phone;

selecting merchandise from a display panel of the vending machine; and

obtaining the selected merchandise from the vending machine.

34. A method for controlling wireless purchase from and on-line inventory managing merchandise in a vending machine, the method comprising:

receiving a first short message originated from a purchaser;

simulating a coin mech signal and transmitting the same to the vending machine to initiate a vending operation;

receiving a merchandise selection message from the purchaser;

dispensing a selected merchandise from the vending machine;

collecting transaction information about the vending operation; and

transmitting the transaction information to a central computer where the transaction information is processed.

35. The method of claim 34 further comprising converting the transaction information to a second short message.

36. A computer program for controlling wireless purchase from and on-line inventory managing merchandise in a vending machine, the computer program comprising:

a software for receiving a first short message originated from a purchaser;

a software for simulating a coin mech signal and transmitting the same to the vending machine to initiate a vending operation;

a software for receiving a merchandise selection from the purchaser;

a software for dispensing a selected merchandise from the vending machine;

a software for obtaining merchandise quantity data from the vending machine;

a software for collecting transaction information about the vending operation; and

a software for transmitting the transaction information and the merchandise quantity data to a central computer where the transaction information and the merchandise quantity data are processed.

37. A system for purchasing merchandise from a vending machine through cellular telephone, the system comprising:

a control and communication unit means for performing inventory data acquisition, controlling vending events, determining alert status, storing vending transaction information, and communicating alert message and vending transaction information to a central computer; the control and communication unit means comprising a micro-controller;

an inventory data acquisition means for collecting the inventory data electronically, the inventory data comprising the number and type of merchandise in each storage compartment and the capacity of each storage compartment for the plurality of storage compartments for storing merchandise to be vended;

a vending event means for at least one vending machine adapted to selectively dispense from a preloaded merchandise inventory at a predetermined price of a predetermined currency, to a purchaser upon payment of the price of the currency either in cash or electronically charged to a stored value card, credit card or cellular mobile phone account;

a vending event controlling means for detecting coin mech signals and disabling other purchase co-exist mechanism if payment is through a coin mech, for simulating coin mech signals to initiate a vending event if the purchaser initiates a purchase by keying in a sequence of predefined code on a cellular mobile phone and electronically charge the cellular mobile phone account, and for simulating coin mech signals to initiate a vending event if the purchaser initiates a purchase by electronically charging the payment to a stored value card or credit card;

a vending transaction means for representing a vending event;

a vending transaction information comprising, for a plurality of storage compartments and for a plurality of vending transactions, data representing every transaction date, time, compartment from which the merchandise is dispensed, quantity counter value, and payment type and account, wherein if the payment is in cash, the payment account has a null entry; if the payment is by a cellular mobile phone, the payment account is the phone number, and if the payment is by a stored value card or credit card, the payment account is the account of the stored value card or credit card;

a date and time means for representing the timing representative of the date and time of the vending events;

a transaction information storage means for storing the transaction information in a memory storage device in the micro-controller;

a transaction information communication means for transmitting the transaction information in an encoded form with error checking through a wireless modem over the cellular mobile telephone network to a central computer;

an alert information means for a plurality of storage compartments for composing an alert message if the inventory in these compartments fall below one of the compartment margin, flavor margin, or the total margin;

an alert information communication means for transmitting the alert message in an encoded form with error checking through a wireless modem over the cellular mobile telephone network to the central computer;

a wireless modem means for communicating with the purchaser if the purchaser initiates a purchase by keying in a sequence of predefined code on a cellular mobile phone, for communicating with the central computer if micro-controller detects that

a predefined period of time has elapsed, or detects a sold out signal, or the activation of a service signal, or a battery low signal, or an AC power being switched on or off, or an error condition, and for communicating with the central computer if the central computer initiates an inquiry; the predefined code comprising an agreed sequence of numbers that uniquely identifies the wireless purchase and the vending machine of which the purchase is to be performed; the predefined period of time means a period of time defined between two consecutive automatic communication of information or data with the central computer;

a power management circuit means for detecting and switching on and off of the AC power supply and providing an alternate power supply if the AC power supply is switched off, for charging a backup battery when the AC power supply is switched on, and for providing power supply to the micro-controller and its peripherals for a period of time until the vending transaction information has been communicated to the central computer;

a display panel means for displaying a number of digits of the cellular mobile phone number during purchasing by the cellular mobile phone, and for displaying the charge of the vending transaction if it is by credit card or stored value card, for displaying the status of the apparatus when being serviced, and for displaying relevant information or error messages representative of the status of the apparatus;

a quantity counter means for a mechanical number counter of the vending machine providing a total count of the sales since the vending machine is first installed;

a service switch means for providing one or more electronic pulses to specify whether it is a refill service or a refill plus flavor change service;

a sold out interface means for detecting the presence of sold out signals from a plurality of storage compartments, for converting the sold out signals into signal levels electrically compatible with the micro-controller signal levels, and for identifying from which storage compartments the sold out signals are generated;

a merchandise dispensing interface means for detecting the presence of the dispensing signal from a storage compartment, for converting the dispensing signal into a signal level electrically compatible with the micro-controller signal level, and for identifying from which storage compartment the dispensing signal is generated;

a merchandise selection interface means for detecting the signal representing the storage compartment that the purchaser has selected on the display panel of the vending machine, for converting the selection signal into a signal level electrically compatible with the micro-controller signal level, and for identifying from which storage compartment the purchaser has selected;

a coin mech signal detection means for detecting the presence of the signals output from the coin mech, for converting the coin mech output signals into signal levels

electrically compatible with the micro-controller signal levels, and for arbitrating the coin mech output signals from the coin mech and signals from other purchasing devices to ensure a contention-free operation; and

a coin mech signal simulation means for converting purchasing signals from cellular mobile phones, credit cards, or stored value cards into electrically simulated coin mech signals as if they are generated from the coin mech.

38. The system of claim 37 wherein the micro-controller further comprising:

a central processing unit means for performing arithmetic and logic operations to handle cellular mobile communication, service interrupts from the interfacing circuits, display information on the display panel means, assemble vending transaction information, create data record from transaction information, write the data record into memory, encode and error check the vending transaction information before sending it through the wireless modem, record vending machine setting, compose alert message, and encode and error check the alert message before sending it through the wireless modem;

a memory unit means for storing data records corresponding to the vending transaction information, machine setting, and alert message;

a peripheral interface unit means for interfacing with the display panel means, the quantity counter means, the service switch means, the backup battery and power management circuit means, the sold out signals, the merchandise dispensing signals, the merchandise display and selection signals, the coin mech signal detection means, and the coin mech signal simulation means;

a real-time clock means for providing date and time information;

a watch-dog circuit means for providing a soft reset to the micro-controller when certain predefined conditions are met; and

a serial interface means for supporting the wireless modem.

39. The system of claim 38 wherein the service switch means comprises a mechanical switch and an electronic interface with the peripheral interface unit means of the micro-controller for providing a single pulse or double pulse timing waveform to the micro-controller, representing refill service or refill and flavor change, respectively.

40. The system of claim 37 wherein the quantity counter means comprises an electronic interface to the mechanical number counter for comparing electronically detected inventory information of a plurality of storage compartments with inventory information obtained by the mechanical number counter.

41. The system of claim 37 wherein the coin mech signal detection means and coin mech signal simulation means comprises:

a signal level conversion circuit means for converting the signal level of the coin mech output signals into levels compatible with the micro-controller and converting the simulated signal level of the micro-controller into levels compatible with the coin mech;

a signal detection circuit means for detecting the levels of the converted signal;

a arbitration circuit means for arbitrating between the signals from different input devices; and

a signal simulation circuit means for simulating the coin mech signal by the micro-controller as if payment is made through the coin mech.

42. The system of claim 37 wherein the sold out interface means comprises:

a signal level conversion circuit means for converting the signal level of a sold out device into levels compatible with the micro-controller; and

a signal detection circuit means for detecting the level of the converted sold out signal.

43. The system of claim 37 wherein the merchandise dispensing interface means comprises:

a signal level conversion circuit means for converting the signal level of a dispensing device into levels compatible with the micro-controller; and

a signal detection circuit means for detecting the level of the converted dispensing signal.

44. The system of claim 37 wherein the display panel means and the merchandise selection interface means comprise:

a signal level conversion circuit means for converting the signal level of a display and selection device into levels compatible with the micro-controller; and

a signal detection circuit means for detecting the level of the converted display and selection signal.

45. The system of claim 37 wherein the power management circuit means comprises:

a power level detection circuit means for detecting a drop in power supply from an output of an AC transformer and for supplying power to the micro-controller and other circuits when the power supply is below a certain level;

a battery charging circuit means for charging the backup battery when the AC power is presence.

46. The system of claim 37 wherein the format of information further comprises:

a setting representing message identification, button-compartment mapping, number of compartments, compartment information, safety margin, last counter reading, scheduled audit time, and error checking;

an acknowledgment/advance control representing message identification, message type, change safety margin, change audit time, change flavor, and error checking;

an online means representing message identification and error checking;

an offline means representing message identification, vending transaction information, inventory report, and error checking;

a short audit means representing message identification, vending transaction information, inventory report, and error checking;

an alert means representing message identification, time stamp, alert level, inventory report, and error checking;

vending transaction information representing time stamp, number of records, records and counter reading; and

an inventory report representing number of compartments and inventory.

47. A system for conducting on-line inventory information acquisition and storage and automatic communication with a central computer for a plurality of vending machines, the system comprising:

providing a machine power up procedure in response to the switching on of an AC power supply to the vending machine, whereby the vending machine enters a normal operating mode and reports its identity to the central computer via the wireless modem and whereby, upon receiving the identity of the vending machine, the central computer searches in its database for the vending machine's last system status, returns the status information to the vending machine, and records the on-line status of the vending machine in the central computer's database; the system status comprising the vending machine selection button-to-storage compartment mapping information; the storage compartment information

comprising flavor, capacity, inventory and price, compartment margin, flavor margin, total margin, quantity counter value, and periodic time elapsed;

providing a machine power down procedure in response to the switching off of the AC power supply to the vending machine, whereby the vending machine transmits to the central computer the system status and transaction information since the last reporting and enters into a sleep mode when the central computer receives and acknowledges the information, and whereby, upon receiving the power off status of the vending machine, the central computer updates the vending machine's entry in the central computer's database;

receiving vending transaction information from a plurality of vending machines initiated by the vending machines at a time determined by a control and communication unit predefined by the central computer;

receiving vending transaction information from a plurality of vending machines initiated by the central computer at a time determined by the central computer;

communicating between the central computer and a plurality of vending machines via the cellular mobile telephone network using a short message service format or a standard data transfer format;

a short message service means for representing the information by a data packet and sending the packet to the cellular mobile telephone network, which buffers the packet and forwards it to a receiver;

providing an identification code for the vending machine for wireless purchase and communication with the central computer;

updating transaction information in the database of the central computer;

exporting the updated transaction information in the central computer to other computer systems;

compiling the updated transaction information in the central computer to an agreed report format;

wherein the central computer comprises:

a fixed telephone line or a cellular mobile phone coupled with a wired or wireless modem for communication; and

a software package means for supporting visualization to the operator of the system, for communicating via the cellular mobile phone network with a plurality of vending machines, for managing database by creating, storing, retrieving, and sorting database records, for producing inventory reports, and for relaying alert messages to the appropriate level of management.